

SOLAR THERMAL



RENEWABLE
ENERGY
PROGRAM

CALIFORNIA ENERGY COMMISSION

Solar thermal electric power is generated from the heat of the sun by using lenses and reflectors to concentrate the sun's energy. Because the heat can be stored, solar thermal electric power plants are unique because they can generate power when it is needed, day or night, and in rainy or sunny weather. Using only one percent of the earth's deserts to produce clean solar energy would generate more electricity than is currently being produced on the entire planet by fossil fuels.

The sun's heat can be collected and converted to electricity in a variety of different ways: **Solar parabolic troughs** consist of curved mirrors which form troughs that focus the sun's energy on fluid-filled pipes. The fluid, typically oil, is circulated through the pipes, heated by the sun and routed through a

heat exchanger to produce steam that drives a conventional electricity-generating turbine. Solar parabolic dish systems have a parabolic-shaped concentrator (similar in shape to a satellite dish) that reflects solar radiation onto a receiver mounted at the focal point at the center. The collected heat is utilized directly by a heat engine mounted on the receiver which generates electricity. The parabolic dish system is the only solar thermal technology that is suitable for stand-alone, small power systems. **Solar central receivers** (see picture) or "power towers" consist of a tower surrounded by a large array of heliostats. Heliostats are mirrors that track the sun and reflect its rays onto the receiver, which absorbs the heat energy that is then used to create steam that drives a turbine electric generator.

California's Mojave Desert contains nine operating solar electric generating systems (SEGS) that were

installed between the mid-1980s and early 1990s. The parabolic trough systems range in size between 14 and 80 megawatts (MW) and have operated successfully for nearly 15 years. The electricity from the plants is sold to Southern California Edison, the local utility, during its peak and mid-peak demand periods. A 10-MW prototype for large-scale commercial solar central receiver power plants, Solar Two is located in the high desert near Barstow,



California. Solar Two has successfully demonstrated how solar energy can be stored in the form of heat (1050 degrees F) in molten salt for power generation on demand. Molten salt retains heat efficiently, so it can be stored for days before being converted to electricity.

The market for SEGS systems should exceed 5,000 MW by 2010. That is enough electricity to serve the residential needs of 7 million people, which will save the energy equivalent of 46 million barrels of oil per year. It will also displace the air pollutants associated with burning the oil for electricity generating or space heating.

Gray Davis, Governor

Mary D. Nichols, Secretary for Resources



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For more information, contact the California Energy Commission Call Center at **1-800-555-7794** or visit our Web Site at:
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